THE JOURNAL OF
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

(Including Transactions)

Volume 36 FEBRUARY 1914 Number 2

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COMING MEETINGS OF THE SOCIETY

February 4, *Boston, Mass.* Subject: Railroad Rolling Stock, Electrical Equipment and Permanent Way, recent developments and present tendencies: Papers by Henry Bartlett, Frederic B. Hall, A. B. Corthell.

February 4, *St. Louis, Mo.*, Engineers Club. Meeting of the Associated Engineering Societies under the auspices of the St. Louis Section. Paper: Air Conditioning, by J. I. Lyle.

February 9, *Philadelphia, Pa.* Subject: Business Training for the Engineer. Discussion by Alex. C. Humphreys, Past-President, Theodore I. Jones and Ralph D. Mershon.

February 10, *New York City*, Engineering Societies Building. Under the auspices of the Sub-Committee on Railroads and the Committee on Meetings in New York. Paper: Brake Performance on Modern Steam Railroad Passenger Trains: A discussion of the results of the Pennsylvania Railroad Brake Tests of 1913, by S. W. Dudley, assistant chief engineer, Westinghouse Air Brake Company, Pittsburgh, Pa.

February 10, *San Francisco, Cal.* Subjects: Transportation of Crude Oil in Pipe Lines; and Proposed Modifications in the Regulations Governing Boiler Tests Where Crude Oil is Used for Fuel.

February 12, *Cincinnati, Ohio*, Engineers Club. Paper: Air Conditioning, by J. I. Lyle. Illustrated by lantern slides.

February 14, *Milwaukee, Wis.* Paper: The Newer Types of High Reduction Gears, Percy C. Day.

Spring Meeting, June 16-19, *St. Paul-Minneapolis.* See pp. iii and iv.

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BINDING THE JOURNAL

At the end of the year an index will be issued to those sections of The Journal containing the Transactions and the review of periodicals, with directions for binding, and members may follow any one of four plans as best suits their taste:

(1) Covers of a standard design will be supplied to members by the Society for use by a local binder, at the rate of $1.25 for half morocco, and 75 cents for buckram, prepaid.

(2) The Journal may be bound by a local binder, using such a cover as the individual member may desire.

(3) If copies of The Journal are sent to the Society, prepaid, the Transactions and the review sections will be bound and returned prepaid, at the rate of $2.25 for half morocco and $1.25 for buckram.

(4) The Society will have a limited reserve stock of printed sheets and can sell bound copies to members outright, at the rate of $4.00 for half morocco and $3.00 for buckram. As the reserve supply is not large, *it is imperative that members wishing to follow this plan should inform the Secretary at once.*

Prices to members abroad will be as above, with additional charge for carriage if such is necessary.

The volume of Transactions will be issued in its old form this year as usual and will contain papers and discussion given during the year 1913. This will be Volume 35 of Transactions and following its publication a complete index of the series, including Volumes 1 to 35, will be printed.

It is intended that Volume 35 of Transactions, to be published this year, shall be the last of the old series, and that dependence shall thereafter be placed upon The Journal for the records as well as for the news of the Society.

The Journal in its new form contains a complete record of the Society's activities, and every member who desires to have such a record in his own library should preserve his copies for binding. The Journal will contain a much more thorough presentation of the technical matter given at the meetings of the Society than could heretofore be included either in The Journal or Transactions, or in both combined. Owing to the necessity for limiting Transactions to a single volume annually, it has recently been possible to include in it only the papers and discussions presented at the Annual and Spring Meetings.

Under the new plan of publication, there will be included, in permanent form for binding, not only the papers and discussion of the Annual and Spring Meetings, but reports of the meetings held by the local sections now organized in twelve cities; and in addition, the review of engineering literature, compiled from the publications which come to the Engineering Societies library, from every part of the world. This section contains the Foreign Review, which has been so favorably received, augmented by a review of the publications of engineering societies in different countries.

In other words, under the present plan it is proposed to concentrate on The Journal and thereby give to the membership a vastly improved service, in accord with the needs of a rapidly growing engineering society. Such a development, however, can be carried out only by an avoidance of the wasteful and expensive duplication of printed matter in The Journal and in the annual volume of Transactions.

This is one of the important considerations which has led the Council and Publication Committee to combine Transactions and The Journal.

SPRING MEETING

The local committee in St. Paul and Minneapolis have been advancing the preparations for the coming Spring Meeting, to be held in these cities from June 16 to 19, and have tentatively arranged a program with provision for the entertainment of their guests and with opportunities for inspection of the many engineering features of that part of the Northwest. The Committee on Meetings have also mapped out the professional sessions for this meeting, the subjects for which are announced in this issue. The program as arranged follows:

TENTATIVE PROGRAM

Tuesday, June 16—St. Paul

Opening of headquarters, registration and acquaintanceship.

8.30 p.m. Reception.

9.30 p.m. Introductory remarks by James Hartness, President of the Society, followed by a message to the Engineering Fraternity, especially the mechanical engineering profession, by Mr. James J. Hill, former president of the Great Northern System.

10.00 p.m. Dancing.

Wednesday, June 17—St. Paul

10.00 a.m. Business meeting and professional session.

During the morning the ladies will be shown about the city and will be entertained at luncheon.

Wednesday Afternoon

The afternoon will be devoted to a second professional session.

Thursday, June 18—Minneapolis

9.15 a.m. Leave for Minneapolis by trolley.

10.00 a.m. Meeting at the University of Minnesota, Minneapolis. Address by Dr. George Vincent, president of the University.

12.00 m. Luncheon at the University Building.

During the morning the ladies will be shown about the city in automobiles.

Thursday Afternoon

The members of the Society and their guests will be entertained at the home of Mr. Gebhard Bohn on Lake Minnetonka. Mr. Bohn has a beautiful home with about twenty acres of ground, constituting the most attractive spot on the lake. Supper will be served and dancing will follow, either here or at the Minnetonka Club.

Friday, June 19—Duluth

Technical excursions. There is also a prospect of a trip to Duluth, in which case it is recommended that the party leave at 2.30 p.m., arriving in Duluth at 7.00 p.m., where they will be received by local members of the Society and will be given an opportunity the next day to look over the Duluth harbor with all its engineering features. It is hoped that boat connections will be such that members from the East can return via the Lakes.

A further suggestion is a trip to Keokuk to inspect the great water power plant on the Mississippi River.

PAPERS FOR THE NEXT SPRING AND ANNUAL MEETINGS

It is proposed by the Committee on Meetings to hold three groups of professional sessions at the Spring Meeting at St. Paul and Minneapolis, June 16-19, these occurring as in the tentative program published this month, on Wednesday morning and afternoon, June 17, and Thursday morning, June 18. There will be an opportunity for simultaneous sessions during these periods, in so far as these seem necessary to cover the subjects offered for the various sub-committees.

It is expected that one session will be upon the subject of Grain Handling and Ore Handling, a topic of local interest for this meeting, and of great general interest as well. The subject is a large and important one, a thorough treatment of which should be on record in the Society's publications.

It is proposed to have one session devoted to papers on Powdered Fuel which it is hoped will bring out data upon the relative merits of powdered fuel and oil and gas fuel for different purposes in industrial work. Papers and discussion for this session are desired on four subjects, as follows: Powdered fuel in open-hearth furnaces; in cement kilns; for the generation of steam; and for industrial furnaces.

A third session will as usual be devoted to miscellaneous papers and it should here be noted that in case more papers are received on general subjects than can be assigned to a single session at the Spring Meeting, there may still be an opportunity to use some of them at least at local meetings of the Society, which are now regularly held in different cities throughout the country. Such papers are earnestly solicited, especially when giving the results of the individual work of members.

Supplementing these three main sessions, it is probable that there will be others arranged by sub-committees. There are already papers in prospect upon the Diesel engine for a Gas Power meeting.

It is requested that any who have papers or data to contribute for the Spring Meeting, however brief or extended they may be, will have their manuscript in the hands of the Committee by April 1.

Among important reports to come up at the Spring Meeting for discussion will be the preliminary report of the Committee to Formulate Standard Specifications for the Construction of Steam Boilers and other Pressure Vessels and for Care of Same in Service, and that of the Committee on Flanges, the latter of which was presented for preliminary discussion at the last Annual Meeting.

ANNUAL MEETING

A tentative schedule for the Annual Meeting to be held next December in New York has also been arranged, with five periods for professional sessions. The opening session, which will be the leading feature of the meeting, will be upon the general subject of the Engineer and Public Relations, taking up also questions of municipal engineering. Prominent engineers and officials in municipal work will be invited to participate.

A session will be devoted to Aviation, which has already aroused much interest from an engineering standpoint at local meetings held in the East. This has led to the belief that the engineer, through his knowledge of the fundamentals of mechanics and physics, has much to contribute to the development of this new science, and that he may be able to give some practical help to those who have been engaged in the conquest of the air.

Another important session will be devoted to En-

gineering Metals, in the production and use of which there have been marked advances during the past ten years. There will be four leading papers, as follows: Steels for Construction, Steels for Cutting Tools, Cast-Irons, Alloys of Copper, Tin and Aluminum. It is expected to have these papers issued several months in advance of the meeting, so that the subject can be fully discussed, thus crystallizing the work of advancement in the various fields and placing on record a synopsis of what has actually been accomplished.

At this meeting there will be two sessions for miscellaneous papers and probably other sessions contributed by the sub-committees. The Sub-Committee on Railroads has already announced its intention of participating.

There are also several important reports to come up for discussion which may in themselves require a session, among these being that on Power Tests, upon which the Committee has been working for a long period of time in an effort to standardize methods and adjust the various apparatus used in the generation of power.

FEBRUARY MEETING IN NEW YORK

The New York meeting for February will be held jointly by the Sub-Committee on Railroads and the Committee on Meetings of the Society in New York, on Tuesday evening, February 10, in the Engineering Societies Building. The paper will be by S. W. Dudley, assistant chief engineer of the Westinghouse Air Brake Company, of Pittsburgh, Pa., upon the air brake tests recently conducted on the Pennsylvania Railroad, with a discussion of important improvements in the braking of heavy passenger cars. These tests are the most elaborate brake tests ever conducted and constitute the most important recent contribution to the subject of air brakes. A train of 12 steel cars, with locomotive and equipment, and a corps of 40 observers, besides extended laboratory equipment, were required for the tests, which extended over a period of three months.

A train of 12 steel cars at 60 miles per hour stores up 224,000,000 ft-lb. of energy. This is sufficient to raise the entire train 120 ft. With prevailing brake equipment such a train would be stopped by an emergency application in a distance of 1600 to 2200 ft., according to the truck rigging and brake shoe design. The Pennsylvania Railroad tests showed that this distance can actually be reduced to 1000 ft., or to within the length of the train. This was the result of improvements in the truck brake design, involving the clasp brake having two shoes per wheel, and the location of the brake shoes with reference to the horizontal center line of the wheels, in addition to improved methods of applying the air brakes quickly and simultaneously and at a high pressure, through an electro-pneumatic control which has not only opened the way for securing the maximum effect in the operation of practically all the factors involved in air-brake apparatus, but has secured a remarkable improvement in flexibility, efficiency, and economy. Trains of fifteen years ago were stopped in about half the distance prevailing in the practice of today. Increased size and weight of equipment have brought about an entirely new brake problem which it was the purpose of these tests to solve.

CORRECTION

In the paper on Increase of Bore by Centrifugal Stresses, by Sanford A. Moss, published in Volume 34 of Transactions, in formula [7] on page 912, the quantity which now appears as r_1 should in each case read r_1^2.

LOCAL ORGANIZATIONS

A feature of local meetings in many of the cities where the Society is undertaking to get its members together is the coöperation existing between the membership of different engineering organizations. By this means, the engineers of a city are brought together, without regard to the particular society to which they belong, resulting in the broadening of acquaintanceship and a mutual helpfulness in advancing the cause of the engineer and in acquainting people generally with the important work which he is undertaking. A circular recently issued by the Engineers Society of Milwaukee is unique in the way in which it unites the organization of the various societies in that city under the common management of a central operative and business organization bearing the title of the Engineers Society of Milwaukee. The first page of the circular is worded as follows:

ENGINEERS SOCIETY OF MILWAUKEE

STOCKHOLDERS

So to say:

Local Members—

American Society Mechanical Engineers
American Institute Electrical Engineers
Verein Deutscher Ingenieure
American Society Civil Engineers
American Chemical Society

Other engineers and technical men in and around Milwaukee.

BOARD OF MANAGERS

Made up of representatives from each of the above National Societies

DUES

Prorated to meet expense of all meetings.

DIVIDENDS

All you can get out of it in the way of Social and Professional profit through the interchange of experience.

One mailing list for all, whether meetings are Sectional or General

No entrance fee required from members of a section.

NEW LIBRARY HOURS

Until April the Engineering Societies Library will remain open daily from 9 a. m. to 10 p. m., instead of until 9 p. m. as heretofore. This change is made for the greater convenience of readers using the library in the evening, who may not find it worth while to come to the building when the time is too short to accomplish any extensive reading. During the past year 12,000 visited the library, making an average of between 40 and 45 readers for each working day.

The library is open to the public each week-day, except Christmas, New Year's, Thanksgiving and Independence Days, with librarians in attendance.

A HIGHER STANDARD OF MEMBERSHIP

The revision of C9 and C11 of the Constitution relating to the membership grades, which has already come up for consideration at the past two meetings of the Society and has been put to letter ballot, raises the interesting question of the relative requirements for the grades affected by these changes in the leading engineering societies.

The proposed amendments raise the grades of Member and Associate-Member to a standard comparable with the highest of any of the societies. They make the following provisions:

C9 A member shall be an Engineer or Teacher of Applied Science of thirty-two years of age, or over, and shall have been in the active practice of his profession for at least ten years and in responsible charge of important work for five years, and shall be qualified to design as well as to direct engineering work. Fulfilling the duties of a Professor of Engineering who is in charge of a department in a college or school of accepted standing shall be taken as an equivalent to an equal number of years of active practice. Graduation from a school of engineering of recognized standing shall be considered as equivalent to two years of active practice.

C11 An Associate-Member shall be a professional engineer not less than twenty-seven years of age, who shall have been in the active practice of his profession for at least six years, and who shall have had responsible charge of work as principal or assistant for at least one year. Graduation from a school of engineering of recognized reputation shall be considered as equivalent to two years' active practice.

If the proposed amendments receive the favorable vote of the members no applications will be accepted for action under the present requirements after March 20.

A comparison of the above with the following requirements will be of interest:

THE INSTITUTION OF CIVIL ENGINEERS OF GREAT BRITAIN

Member: 33 years old; further than the requirements for Associate-Member, five years employment in positions of responsibility for the design or execution of important engineering work, or suitable education and training as a civil engineer; and further at least 15 years employment in positions of responsibility.

Associate-Member: 25 years old; educated as a civil engineer and actually engaged in the design or construction of works comprised within the profession of a civil engineer.

THE INSTITUTION OF MECHANICAL ENGINEERS OF GREAT BRITAIN

Member: 30 years old; regularly trained as a mechanical engineer; engaged for a sufficient period in important position of independent responsibility in direction of engineering work.

Associate-Member: 25 years old; regularly trained as a mechanical engineer, with sufficient practical experience in the direction or design of engineering work. If over 30 years of age he must have further at least one year in responsible engineering position.

AMERICAN SOCIETY OF CIVIL ENGINEERS

Member: 30 years old; a professional engineer, architect, or marine architect; in active practice of his profession for ten years; in responsible charge of work five years; qualified to design and to direct engineering works.

Associate-Member: 25 years old; in active practice of his profession six years; in responsible charge of work as principal or assistant one year.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Fellow (equivalent to Member, Am. Soc. M. E.): 32 years old; ability to design and take responsible charge of important electrical work; in active practice of his profession ten years and in responsible charge three years.

Member (equivalent to Associate-Member, Am. Soc. M. E.): 27 years old; electrical engineer by profession, in active practice in responsible work five years.

AMERICAN INSTITUTE OF MINING ENGINEERS

Member: all professional mining engineers, geologists, metallurgists, or chemists, and all persons actively engaged in mining and metallurgical engineering, geology or chemistry.

(No grade equivalent to Associate-Member grade of Am. Soc. M. E.)

COUNCIL NOTES

At the meeting of the Council on January 9 a report was received from the Joint Conference Committee, with resolutions covering a memorial presented by the American Institute of Consulting Engineers, urging the appointment of engineers as members of public service commissions. This report was referred to the Public Relations Committee.

The following Sub-Committee on Railroads was appointed: E. B. Katte, Chairman; G. M. Basford, W. G. Besler, F. H. Clark, A. H. Ehle, C. E. Eveleth, W. F. M. Goss, A. L. Humphreys, W. F. Kiesel, N. W. Storer, H. H. Vaughan, R. V. Wright.

The representatives of the national engineering societies, including the Society for the Promotion of Engineering Education, recently met with the representatives of the Carnegie Foundation for the Advancement of Teaching, and the latter will undertake to prepare a special report of the status of engineering education in America. It is proposed to engage the ablest available man to prepare this report, under the direction of Dr. Henry S. Pritchett, president of the Foundation.

CALVIN W. RICE, *Secretary.*

APPLICATIONS FOR MEMBERSHIP

Members are requested to scrutinize with the utmost care the following list of candidates who have filed applications for membership in the Society. These are sub-divided according to the grades for which their age would qualify them and not with regard to professional qualifications, i. e., the age of those under the first heading would place them under either Member, Associate or Associate-Member, those in the next class under Associate-Member or Junior, while those in the third class are under twenty-five years of age and therefore qualified for Junior grade only. The Membership Committee and in turn the Council urge the members to assume their share of the responsibility of receiving these candidates into the membership by advising the Secretary promptly of any one whose eligibility for membership is in any way questioned. Members will be furnished with complete records of any candidate thus questioned. All correspondence in regard to such matters is strictly confidential and is solely for the good of the Society, which it is the duty of every member to promote. These candidates will be balloted upon by the Council unless objection is received before March 10, 1914.

FOR CONSIDERATION AS MEMBER, ASSOCIATE OR ASSOCIATE-MEMBER

ADAMSON, KEITH F., Instr. in M.E., University of Penna., Philadelphia, Pa.

AMNEUS, NILES A., Mech. Designer, Bird & Son, East Walpole, Mass.

BELL, JAMES A., M.M., Illinois Steel Co., Joliet, Ill.

BJORK, CARL G., Mech. Draftsman and Designer, Stone & Webster Engrg. Corp., Boston, Mass.

BRADLEY, JOHN E., Pres., Osgood Bradley Car Co., Worcester, Mass.

BUENTING, OTTO W., Genl. Supt., Westinghouse Air Brake Co., Wilmerding, Pa.

BURNETT, R. W., Genl. Master Car Builder, Canadian Pacific Railway, Montreal, P. Q.

BUSE, F. W., Ch. Engr., Deutsche Maschinenfabrik A.G., Duisburg,—Office at 82 Beaver St., New York.

CALKINS, MARCUS E., Pres. and Genl. Mgr., Cayuga Lake Cement Co., Ithaca, N. Y.

CARLSON, CHARLES A., Genl. Draftsman, Deere & Co., Moline, Ill.

COE, RALPH T., Mgr., Canadian Sirocco Co., Ltd., Windsor, Ont., Canada.

CRAMER, ROBERT, Engr. & Designer, Motor Engrg. Co., Chicago, Ill.

CUMMISKEY, WM. M., Elec. Engr., Gurney Elec. Elev. Co., Honesdale, Pa.

DALLEY, A. H. CHAS., Mgr., Amer. Engrg. Co. of Phila., Chicago Office, Chicago, Ill.

DRESES, HENRY, Prop. and Mgr., Dreses Machine Tool Co., Cincinnati, Ohio

EVELETH, CHARLES E., Railway and Traction Engrg. Dept., General Elec. Co., Schenectady, N. Y.

FIELD, ALFRED F. JR., Asst. to Mgr., The Stanley Works, Bridgewater, Mass.

FORD, HENRY R., Vice-Pres., McCarthy Bros. & Ford, Buffalo, N. Y.

GIRL, CHRISTIAN, Pres. & Genl. Mgr., The Perfection Spring Co., Cleveland, Ohio

GISH, JAMES A., JR., Asst. Wks. Mgr., Bath Portland Cement Co., Bath, Pa.

GOSS, STANLEY T., Mch. & Automatic Dept., New Britain Mch. Co., New Britain, Conn.

GRISWOLD, F. M., Genl. Inspr., The Home Insurance Co., New York

HOFFMAN, WILLIAM A., Inspector of Boilers, Elevators and Smoke Abatement, City of St. Louis, Mo.

HOWELL, JOHN W., Engr., Edison Lamp Works of General Elec. Co., Harrison, N. J.

JOHNSON, CHARLES S., Engr., Marion Steam Shovel Co., Marion, Ohio.

LARMER, JAMES G., Asst. M.M., Homestake Mining Co., Lead, S. D.

LINSHEIMER, SIDNEY W., Vice-Pres. and Genl. Mgr., The Holly Sugar Co., Denver, Colo.

LOUDER, JAS. W., Supt., Nazareth Cement Co., Nazareth, Pa.

MCINTYRE, JAMES K., Mech. Engr. at Works, Alberger Pump & Condenser Co., Newburgh, N. Y.

MOSES, ASHLEIGH S., Ch. Engr., National Lead Co. and St. Louis Smelting & Refining Co., St. Louis, Mo.

NEWCOMER, GEORGE M., Vice-Pres., F. L. Smidth & Co., 50 Church St., New York

NEWTON, GUY D., Instructor, University of Missouri, Columbia, Mo.

PARKS, FREDERICK W., Pres., The G. M. Parks Co., Fitchburg, Mass.

PARKS, HOWARD M., Vice-Pres., The G. M. Parks Co., Fitchburg, Mass.

PAULEY, JAMES B., Mgr., European Purchasing, International Harvester Corp., Brussels, Belgium

PHILLIPS, CHARLES H., Designer of Special Automatic Machinery for Threading Bolts, Buffalo, N. Y.

PRATT, FREDERICK R., M.M and Ch. Engr., Berkshire Cotton Mfg. Co., Adams, Mass.

ROBERTSON, REUBEN B., Genl. Mgr., The Champion Fibre Co., Canton, N. C.

SEEKAMP, CONRAD F., with Otis Elevator Co., New York

STEPHENS, WILLIS C., Eastern Mgr., Rice & Adams, Buffalo, N. Y.

STORRS, LUCIUS S., Pres., Connecticut Co., New Haven, Conn.

SUMMERS, LEWIS E., Mgr., Chicago Pneumatic Tool Co., Detroit, Mich.

THOMPSON, DAVID P., Asst. Genl. Supt., Inland Steel Co., Indiana Harbor, Ind.

TOURJEE, WILLIAM O., Mech. Engr., W. A. Harris Steam Engine Co., Providence, R. I.

TRUSCOTT, HAROLD S., Factory Supt., Hawaiian Sugar Co., Ltd., Makaweli, Kauai, T. H.

VAN DEVENTER, JOHN H., Genl. Supt., Buffalo Forge Co., Buffalo, N. Y.

WELLS, WILLIAM H., Supt. and Mech. Engr., George W. Blabon Co., Nicetown, Philadelphia, Pa.

WHITLOW, JOSEPH A., Ch. Engr., Board of Education, St. Louis, Mo.

WILLETT, WALLACE, Engr., with Nicholas S. Hill, 100 William St., New York

ZIMMERMANN, WM. F., Vice-Pres., Pittsburgh Testing Laboratory, 50 Church St., New York.

FOR CONSIDERATION AS ASSOCIATE-MEMBER OR JUNIOR

BARNUM, C. LESLIE, Mech. Engr., J. B. King & Co., New Brighton, N. Y.